

Fuse Primer

So what are actual important characteristics of a fuse? Three things -

1. The current (ampere) rating of the fuse
2. The blow time of a fuse
3. The voltage rating

I'll touch on each of these with a little bit of background.

The current rating of a fuse

This one is fairly straight forward – the current or ampere rating of a fuse is the maximum amount of DC or AC current that the fuse can handle before it will blow. A fuse rated at 20 amps should allow a 20 amp load indefinitely, but if a 25 amp load was applied, the fuse would blow.

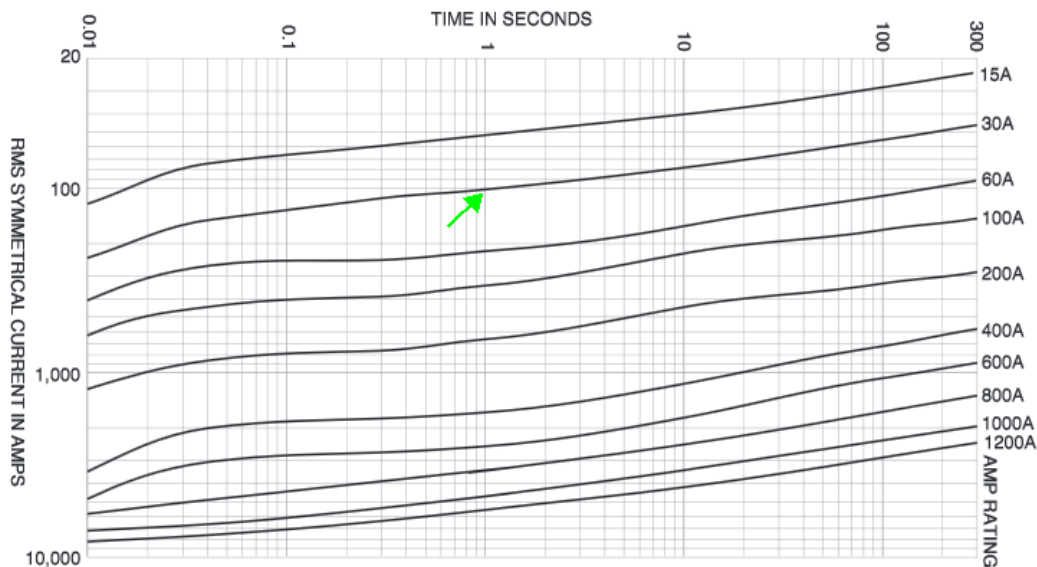
A couple of common questions related to current ratings:

- Does the current rating of a fuse change if I run DC or AC?
 - The answer for our intents and purposes, no. A 20 amp fuse will handle 20 amp load regardless of if it is a DC or AC system
- Dose the voltage I run at affect the current rating?
 - Again, for our purposes, no. A 20 amp will handle a 20 amp load at 30 volts just as well as it will handle a 20 amp load at 60 volts. **There are exceptions to this that will be covered in the voltage rating section.**

The blow time of a fuse

The blow time of a fuse is simply how long the fuse will take to pop at a given load. In general, blow times fall into three categories that are defined by various standards: Fast (or Very Fast) Blow, Normal, and Time Delayed. Fast and Very Fast Blow fuses are some of the quickest to pop, while Time Delayed are intended to last seconds to minutes before they pop.

So how long would it take a “30 Amp” Fast Blow type fuse to blow with a 100 amp load?



[Bussmann JN Time Current curves form Spec Sheet Found [HERE](#)]

The answer (for a JN series 30 Amp fuse) is about 1 second. Actually from this chart you can also see that at a 40 amp load the 30 amp fuse would take more than 300 seconds to blow. This is one reason why the rules limit the fuse size to 125% of your expected current draw – fuse ratings are conservative. (From this same chart you can see that a 100 amp fuse can actually take a 150 amp load for more than 300 seconds).

Fuses rated for Fast Blow are typically marked with “F” and Very Fast Blow with “FF”. Time delayed fuses are marked with “T”, so they should be avoided.

The voltage rating of a fuse

Wait, earlier I said voltage doesn't matter, so what is the deal with voltage rating? The voltage rating defines the maximum voltage a fuse can stop before an arc can form across a blown fuse. Yes, even if the fuse is blown, it may not protect your system in the event of a short.

For example, if I have a fuse that's rated at a voltage of 32 volts DC, will it protect my car that's running a 72 volt battery pack? The answer here is very much **NO**. The system at 72 volts would have enough potential to arc across the gap in the blown fuse, making the fuse worthless. Put another way, a 32 VDC fuse is only good for systems running up to 32 volts DC.

Ok, how about another common example... I have a fuse is rated for **125 volts AC** (VAC). That will work for my 72 volt DC (VDC) car right? **NO**. The nature of alternating current means it is much less likely to arc than direct current, so the AC voltage ratings are almost always much higher than the DC voltage rating.

Wait, is there a way to tell what the DC rating is from the AC rating? The short answer is no. Fuses differ from manufacturer to manufacturer and between different fuse styles. The only way to know for sure is to either see it printed on the fuse or on the manufacturer's spec sheet. This is why the rules require spec sheets for main battery pack fuses.